

## 4 Pledging the future

**I**N APRIL 2011, a small Australian power firm, CBD Energy, announced a \$6 billion partnership with two large Chinese electricity firms, China Datang Renewable Power Co and Tianwei Baobian Electric Co. The joint venture plans to build a string of new wind and solar power plants across Australia.

The joint venture went ahead without any signed power purchase agreements with energy retailers and despite regulatory uncertainty surrounding carbon pricing and renewable energy targets.

The low cost of finance and technology from the Chinese side of the deal made the deal possible. Both China Datang and Tianwei Baobian are government-owned enterprises with ambitious goals for expansion into global renewable energy markets.

Australia's dedicated climate news service, Climate Spectator, described the deal as a game changer for Australian renewable power:

If Australian companies can't get around to building their own renewable projects, then the Chinese will do it for them. Hu Guodong—vice president of Datang Renewable Power Co, the listed offshoot—says the slow rollout of renewable projects in Australia has presented an irresistible opportunity for companies such as his. 'Australia has amazing solar and wind resources.'

The deal captured the essence of shifting global leadership in climate change mitigation. While Australia has spent the last four years bickering, China has pledged large carbon intensity reduction targets, implemented reforms that deliver on its commitments, and set sail on a global mission to dominate new opportunities.

If we're to understand who precisely is doing what, let's begin with a look at their pledges.

### **The pledges**

To date, 89 developed and developing countries, representing more than 80 per cent of global emissions and about 90 per cent of the global economy, have pledged large cuts and actions under the Cancun Agreements.

The quantitative pledges on 2020 emissions by a selection of major developed countries are listed in Table 4.1.

**Table 4.1: Mitigation pledges to 2020 by selected major developed countries under the Cancun Agreements**

| Country or region | Pledge  |
|-------------------|---|
| Australia         | <ul style="list-style-type: none"> <li>• 5% reduction relative to 2000 unconditional</li> <li>• Up to 15% reduction if there is a global agreement that falls short of securing stabilisation of greenhouse gases at 450 ppm carbon dioxide equivalent and under which major developing economies commit to substantially restrain emissions and advanced economies take on commitments comparable to Australia's</li> <li>• 25% reduction if the world agrees to an ambitious global deal capable of stabilising levels of greenhouse gases in the atmosphere at 450 ppm carbon dioxide equivalent or lower</li> </ul> |
| Canada            | 17% reduction relative to 2005; to be aligned with the final economy-wide emissions target of the United States in enacted legislation  |
| European Union    | <p>20% reduction relative to 1990; 30% reduction as part of a global and comprehensive agreement, provided that:</p> <ul style="list-style-type: none"> <li>• other developed countries commit themselves to comparable emissions reductions</li> <li>• developing countries contribute adequately according to their responsibilities and respective capabilities</li> </ul>   |
| Japan             | 25% reduction relative to 1990, premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets   |
| New Zealand       | 10% to 20% reduction relative to 1990, conditional on a comprehensive global agreement to limit the temperature increase to less than 2°C, with effective rules for land use, land-use change and forestry regulation, recourse to a broad and efficient international carbon market, and advanced and major emitting developing countries taking comparable action commensurate with their respective capabilities   |
| Russia            | 15% to 25% reduction relative to 1990, conditional on appropriate accounting of the potential of Russia's forestry sector, and legally binding obligations by all major emitters  |
| United States     | Reduction in the range of 17% relative to 2005, in conformity with anticipated US energy and climate legislation, recognising that the final target will be reported to the UN Framework Convention Secretariat in light of enacted legislation   |

As is obvious from Table 4.1, in defining their pledges, countries have chosen different types of commitments and different base years. We can, however, interpret these commitments in terms of what would be a fair share from each country in the 2008 Review's modified contraction and convergence framework.

The pledged target ranges for the United States, the European Union and Japan all correspond to entitlements for a global agreement between 450 ppm and 550 ppm. The targets pledged by Canada and Russia, by contrast, are less

ambitious than suggested for a 550 ppm global agreement. And, on average, developed countries' pledged 2020 targets are somewhat less ambitious than are needed under a 550 ppm scenario.

For developing countries, fair shares are measured not in absolute reductions but in reductions in emissions intensity (see Table 4.2). The modified contraction and convergence framework of 2008 implied a targeted reduction in China's emissions intensity of 35 per cent from 2005 to 2020 if global concentrations of carbon dioxide were to be limited to 450 ppm. At Copenhagen and Cancun, China pledged to reduce its carbon intensity by 40 to 45 per cent from 2005 to 2020. It thereby exceeded what was viewed as an adequate commitment even under an ambitious global agreement. India has pledged reductions in emissions intensity of 20 to 25 per cent on 2005 levels by 2020. Its proportional emissions intensity reduction for a 450 ppm outcome would have been 43 per cent. The Parikh report on low carbon growth strategies to the Indian Prime Minister in May 2011 commented that India could achieve emissions intensity reductions in the range 33 to 35 per cent with support from international financing and technological transfer.

The comparison of China's and India's 'fair shares' of a strong global agreement is determined by the arithmetic of modified contraction and convergence. The details of my 2008 formula are not the important thing, so long as the outcome is consistent with global goals. China's pledge exceeded its suggested emissions reduction by more than India fell short of its reduction. Experience has demonstrated that an alternative formulation of modified contraction and convergence is more realistic: China sets for itself an ambitious goal of reducing emissions intensity at a rate of 45 per cent over 15 years, and other rapidly developing countries go as close to that as possible.

A number of major developing countries have pledged reductions relative to a business-as-usual scenario (including Indonesia, Brazil, Mexico, South Africa and the Republic of Korea). Analyses of plausible business-as-usual scenarios have shown that, if realistic baselines are applied, the Copenhagen pledges imply reductions in absolute emissions in these countries between 2005 and 2020. These, too, are as ambitious—or more ambitious—than were called for under the modified contraction and convergence framework developed and proposed in the 2008 Review.

Overall, the modified contraction and convergence framework suggests that global commitments add up to somewhere near the level of reductions in emissions needed to limit greenhouse gas concentrations to 550 ppm. Within the same framework, developing countries are leading the effort in relation to their respective fair shares.

**Table 4.2: Comparison of the Cancun pledges and notional entitlements under the 2008 Review's modified contraction and convergence framework**

| Country or region                              | Target type   | Cancun pledges:<br>change in absolute<br>emissions at 2020<br>relative to 2000 <sup>a</sup> | 2008 Review: emissions<br>entitlement allocations at<br>2020, relative to 2000–01  |              |
|--|---|---|--|--------------|
|  |   |   | 550 scenario   | 450 scenario |
| Australia                                      | Reductions<br>in absolute<br>emissions                                    | –5% to –25%   | –10%   | –25%         |
| Canada   |   | –13%  | –33%   | –45%         |
| European Union                                 |   | –12% to –23%  | –14%   | –30%         |
| Japan  |   | –33%  | –27%   | –41%         |
| New Zealand                                    |   | –27% to –35%  | n.a.   | n.a.         |
| Russia   |   | +15% to +31%  | n.a.   | n.a.         |
| United States                                  |   | –16%  | –12%   | –28%         |
| <i>Weighted average of developed countries</i> |   | <i>–10% to –16%</i>   | <i>–15%</i>  | <i>–31%</i>  |
|  |   | Cancun pledges:<br>reduction in<br>emissions intensity,<br>2005 to 2020                     | 2008 Review: reduction in<br>emissions intensity 2005 to<br>2020, applying the Review's<br>suggested approach <sup>b</sup> |              |
| China <sup>c</sup>                             | Reductions<br>in emissions<br>intensity (ratio<br>of emissions<br>to GDP) | –40% to –45%  | –35%   |              |
| India  |   | –20% to –25%  | –43%   |              |

n.a. = not applicable.

- Computations for developed countries (absolute targets): Countries' targets are converted from their chosen base years (see Table 4.1) to the 2000 base year used by the Review using estimates of total greenhouse gas emissions, excluding emissions from bunkers and land use, land-use change and forestry. The base year adjustment accounts for divergences from countries' submitted pledges as listed in Table 4.1, including the large divergence for Russia due to significant reductions in emissions between 1990 and 2000.
- Computations for China and India (emissions intensity targets): The modified contraction and convergence approach articulated in the 2008 Review allows developing countries growth in emissions entitlements at half the rate of their GDP. In calculating emissions intensity to allow comparison with emissions intensity targets, this rule was applied for the period 2013 to 2020. The difference in required emissions intensity reductions between China and India is because of different rates of change in emissions intensity during the period 2005 to 2012 which are carried forward in an assessment under the Review's proposal. If the Review's rule of half the rate of GDP growth had applied from 2005, the 2005 to 2020 reductions in emissions intensity for China and India would have been 44 and 43 per cent respectively.
- China's emissions intensity target only applies to carbon dioxide emissions.

The OECD's International Energy Agency formed a more pessimistic assessment, suggesting that existing commitments were heading towards 650 ppm. Frank Jotzo suggests that the Cancun commitments of others would trigger movement to minus 15 per cent in Australia within the conditional target entered at Cancun. The differences between the Garnaut Review and International Energy Agency assessments derive from different approaches to what happens after 2020. The point of difference is whether rapidly growing developing countries accept the suggestion that they should commit to reducing absolute emissions within a straightforward contraction and convergence framework once their emissions per person have reached the (falling) average emissions per person of the developed countries.

### **Countries making big pledges**

While the US scientific community was instrumental in placing the global warming issue on the international policy agenda, Europe is at the forefront of policy action.

The Scandinavian countries were the world's first movers on substantial climate change mitigation policy and they have stayed in front. They have been pricing carbon since 1991. This is one reason why Norway is not a carbon-intensive economy, despite being the only other developed country with endowments of fossil fuels that are in any way comparable to Australia's. Norway's emissions per person are 10.9 tonnes, and Australia's 27.3 tonnes.

For those who fret about the effect of a carbon price on some generalised notion of Australian 'competitiveness' and who believe that measures of such things have meaning, Denmark, Finland, Norway and Sweden have all been higher than Australia on the World Economic Forum's Global Competitiveness Index every year over the past decade. In several years they have occupied three of the top four places among 139 countries, and in all years three of the top ten. Australia's ranking has ranged between 5th in 2001 and 16th in 2010, and has fallen as low as 19th. Australia has not ranked in the top ten since 2003. Norway, in particular, has played a leading role in providing support for mitigation in developing countries, including in Indonesia.

The European Union established an emissions trading scheme in 2005 and has steadily tightened its parameters since then. The European Union's conditional targets are relatively strong compared to those of other developed countries within the framework of modified contraction and convergence. Half the people in the developed world—half a billion people—are covered by the European Union's emissions trading scheme.

The major Western European economies, including Germany, France and the United Kingdom, have gone well beyond the mitigation requirements of the European Union of which they are members. The United Kingdom has recently confirmed a considerable increase in the ambition of its emissions reduction targets in the midst of continued economic pressures in the aftermath of the Great Crash of 2008.

The Conservative-led coalition government under Prime Minister David Cameron came to power with commitments to extend the strong mitigation policies of the Labour government that it replaced. The government's resolve was tested when the independent committee on climate change recommended the legislation of a target to reduce emissions by 60 per cent from 1990 levels by 2030. This is from levels that are already relatively low: in 2005, UK total emissions were 1.7 per cent of global emissions, compared to Australia's portion of almost 1.5 per cent. The committee's recommendations were debated at length in cabinet, and their acceptance was announced in May 2011. The new targets—50 per cent from 1990 levels by 2025—will now be binding under domestic law.

China took proposals for major reductions in emissions below business as usual to the Copenhagen meeting. It agreed to reduce the emissions intensity of output by 40 to 45 per cent from 2005 levels by 2020. China also committed to implementing the world's largest program of sequestration through forestry. Forest coverage was to increase by 40 million hectares and forest stock volume by 1.3 billion cubic metres from 2005 to 2020. And China pledged to increase the share of non-fossil fuels in primary energy consumption to around 15 per cent by 2020.

There have been suggestions after the event that China's carbon intensity commitments only reflect what China was doing anyway. That view cannot survive analysis of the economic realities or of the Chinese political economy. These goals were originally opposed by official advisers with responsibility for economic policy on the grounds that they may be unattainable, or attainable only at unacceptable cost to economic growth. Once they had been accepted by the leadership, it became the responsibility of the economic officials to make sure that they were achieved.

China is now implementing these commitments. The five-year plan for 2011–2015 approved by the National People's Congress in March 2011 announced a target of reducing the emissions intensity of national production by 17 per cent over the five-year period. The carbon intensity targets have been devolved down to provincial levels, and from there to local governments.

National officials have stepped in to override local government decisions that were thought to be inconsistent with the national objectives.

The authorities have pursued multiple environmental, energy security and other objectives by closing many emissions-intensive plants, and constraining energy supply or raising the cost of energy to others. There has been a rapid reduction in the emissions intensity of coal-fired electricity generation. Environmentally damaging, unsafe and economically inefficient small coal-fired generators have been closed at the rate of one every ten days or so. They have been replaced by larger plants that are economically and environmentally much more efficient. China decommissioned smaller, environmentally and economically inefficient plants with combined generation capacity of 70 gigawatts—one and a half times the total Australian power generation capacity of the electricity market.

Specific fiscal interventions have restricted or raised the costs of inputs to the most emissions-intensive industries, including steel, aluminium and cement. Some of these industries have been denied the rebates for exports that are normal in value-added-tax regimes in China, Australia and elsewhere, amounting to a large discriminatory tax on these emissions-intensive, trade-exposed industries. Some provinces now impose a surcharge on power use equivalent to either \$19 per tonne of carbon dioxide on electricity used in highly emissions-intensive plants or \$57 per tonne of carbon dioxide on electricity used in excessively emissions-intensive plants in eight ‘high-polluting’ industries. The high-polluting industries include aluminium, steel and cement.

There has also been substantial fiscal support and regulatory intervention to accelerate the deployment of a wide range of low-emissions technologies in energy and transport. The central government allocated \$30 billion of its own funds to energy efficiency and emissions reductions projects in the five-year plan for 2006–10, generating total investment of \$300 billion.

The interventions that have reduced growth in greenhouse gas emissions are varied and complex, but in total have had a major effect on business costs and the way business is run. At the margins at which investment decisions are made, these have had large impacts. Over time, the interventions will reduce Chinese production and export capacity to well below where it would otherwise have been in aluminium, steel, cement and other highly emissions-intensive industries. This will tend to raise product prices on world and Australian markets.

The low-emissions technologies were a special focus of China’s stimulus packages, adopted in late 2008 and early 2009 in response to the Great

Crash. There was massive support for deployment of virtually all of the low-emissions technologies: solar, wind, nuclear, biomass and hydro-electric. There was major investment in the electricity transmission grid to reduce energy losses and to facilitate integration of new sources of electricity. There was a major focus on accelerating the commercialisation of electric cars. There was huge commitment to expansion of public transport within urban areas, and extraordinarily rapid progress in developing 13,000 kilometres of fast train infrastructure to join up most of the large cities of China.

Not all of this went smoothly. There were examples of wind power capacity growing well in excess of the grid's ability to use the product. There was criticism by economists of wasteful levels of subsidy for deployment of rooftop solar and electric cars. But the overall effect was transformative. Problems have been identified and corrected. For example, the problems with absorbing rapid increases in wind power seem to have been reduced quickly by accelerated introduction of 'smart grid' technology. The Chinese grid authorities are following closely recent technological developments in the United States.

The Chinese economic policy authorities have been surprised by the rate at which the costs of the low-emissions technologies have fallen.

Costs of nuclear power have fallen so much that in coastal China nuclear is close to being economically competitive, with the relative costs continuing to move in its favour. The alternative involves the import of expensive coal from Australia and elsewhere or the expensive transportation of coal from the inland of China using hopelessly overextended rail and road systems. Soon the main constraint on expansion of nuclear at the expense of coal will not be cost, but anxiety about supplies of high-grade uranium oxide. Concern about nuclear safety issues in the wake of the March 2011 earthquake and tsunami in Japan has led to planned nuclear projects being suspended pending assessment of the recent Japanese experience. This is likely to lead to confirmation of the program with stronger safety standards.

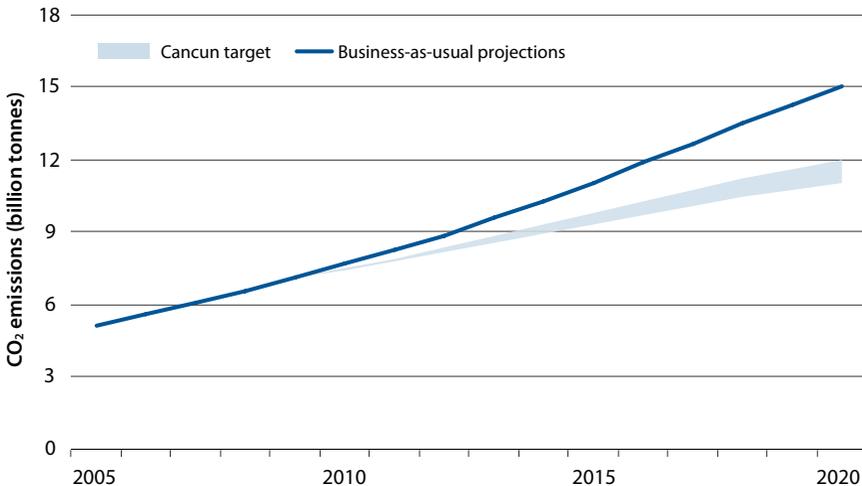
Costs of wind power have fallen by one-fifth in two years despite the general inflationary environment in China. The cost of solar photovoltaic units has been decreasing rapidly and, as this is a younger technology, will continue to do so for some time.

Most Chinese mitigation so far has been through regulatory interventions. In August 2010, China's National Development and Reform Commission launched a national low-carbon province and low-carbon city experimental project. The eight cities and five provinces covered by the project will develop emissions reduction plans and explore options to use market mechanisms

to achieve abatement goals. There has been discussion of linking emerging market-based arrangements to the European Union emissions trading scheme. China also plans to impose a new tax on coal, oil and gas extraction in its western provinces. The tax, introduced in June 2010 in Xinjiang, China's largest gas-producing province, will be broadened to include all western areas.

What once seemed unattainable targets to Chinese economic authorities are now viewed with confidence. Officials have been pleasantly surprised at the rate of decrease in costs and are now talking confidently of reaching the high point of the emissions intensity reduction. Figure 4.1 compares what China's emissions would have been under business as usual with the emissions projected under its Cancun target.

**Figure 4.1: China's emissions under its Cancun target and business as usual (actual to 2010, then projections)**



Source: Garnaut update paper 3, *Global emissions trends* (based on International Energy Agency 2010, *CO<sub>2</sub> emissions from fossil fuel combustion 2010*; IMF 2010, *World economic outlook—recovery, risk and rebalancing*; International Energy Agency 2010, *World energy outlook 2010*; BP 2010, *Statistical review of world energy 2010*).

China would not have committed itself to the targets offered under the Copenhagen Accord if they had been internationally legally binding, but senior officials are now suggesting privately that China may strengthen the nature of its commitments in the context of stronger international agreement.

China's actions represent by far the largest contribution to reducing global emissions below what they would have been under business as usual. These developments in China are the most important reason why uneven progress in most of the world since 2008 has not left a 2°C objective permanently out of sight. China's progress has also reduced the cost of capital items for

deployment of solar and wind power in other countries. It may eventually do the same for nuclear power and rail transport.

This dimension of Chinese reality is confusing when placed alongside another: the fact that China's total emissions are still growing rapidly, and will continue to do so for some time.

The emissions numbers from China are daunting; they have become the largest in the world and continue to increase. But when we analyse them with clear heads they represent good news. China is doing what would be a fair share of a strong global effort, given its level of development and rate of growth.

China's rapid acceleration of growth in the 21st century will take its emissions per person to the (falling) average for developed countries in less than a decade. China's absolute emissions will then need to fall in line with those of the developed countries. The Chinese Government has not yet turned its mind to this next step.

Indonesia's pledges represent big steps. There is no doubting the commitments of leaders, but there are formidable political economy barriers to turning pledge into achievement. Indonesia has committed to reining in deforestation and improving land management in a bid to help fulfil its pledge to cut emissions by 26 per cent relative to business as usual by 2020. This pledge could rise to 41 per cent with international support. A moratorium on issuing new licences for land conversion was included as part of a US\$1 billion agreement with Norway, and initiatives to improve institutions, incentives and monitoring in the forestry sector are under way. This includes the Indonesia–Australia Forest Carbon Partnership. Indonesia is also considering options for expansion of geothermal power production as a zero-emissions alternative to new coal-fired electricity generation. The Indonesian Government is considering financial incentives for investment in low-carbon power supply, and a carbon tax is currently being mooted in response to a 2009 Ministry of Finance climate policy strategy paper.

In 2008, Brazil committed through its National Climate Change Policy to reducing greenhouse-gas emissions by between 36.1 and 38.9 per cent by 2020, relative to business as usual. The policy pledges that fiscal and tax measures are to be introduced to bring about these emissions reductions. The Brazilian Government aims to reduce electricity consumption by 10 per cent by 2030 through a range of direct action measures. Much of Brazil's emissions reductions are likely to come through changes to land use. The Brazilian Government aims to reduce deforestation to 80 per cent of the annual average between 1996 and 2005 and to double the area of forest plantation by 2020.

## Experience and experiments with carbon pricing

As with the Kyoto Protocol, countries that pledged targets or actions under the Copenhagen Accord were free to determine the policy measures they would put in place to achieve their pledged targets or actions.

More than half of the population of the developed world lives in countries with emissions trading schemes. More than 30 countries have introduced, or are seriously considering introducing, market-based measures to help meet their emissions reduction targets affordably and efficiently. Several countries' carbon-pricing mechanisms include design features that allow the rate of emissions reductions to be accelerated if other countries take on more ambitious targets. Countries and regions that have implemented carbon-pricing mechanisms—for example, New Zealand and the European Union—are considering various options to link up their trading schemes.

The European Union emissions trading scheme operated under an explicit trial phase between 2005 and 2007 and is currently in its first full phase, which runs from 2008 to 2012. The scheme covers more than 11,500 installations, which represent around half of Europe's carbon dioxide emissions and about 40 per cent of its greenhouse gas emissions. The 27 European Union member states, plus Iceland, Liechtenstein and Norway, are covered by the scheme.

New Zealand's emissions trading scheme started in 2008, initially covering forestry. Transport fuels, electricity production and industrial processes were added on 1 July 2010. Transitional measures in place between July 2010 and December 2012 allow participants to buy emissions units from the New Zealand Government for a fixed price of NZ\$25. At the same time, participants in the energy, industrial and liquid fossil fuel sectors are required to surrender only one emissions unit for every two tonnes of emissions they produce. The combined effect of these measures is to cap the price of emissions units at NZ\$12.50 until the end of 2012.

In 2010, the Japanese Government announced its intention to pass legislation that supported an emissions trading scheme, a carbon tax and feed-in tariff measures. However, in late 2010, the government announced that it would delay, but not scrap, plans to implement an emissions trading scheme. A number of voluntary schemes exist in Japan. These include the Japanese voluntary scheme, which was launched in 2005, and the experimental scheme, launched in 2008. The Tokyo Metropolitan Government also launched an emissions trading scheme in April 2010. The Japanese private sector has taken big steps to put itself in a leading position technologically in the development of products and processes that are suitable to a low-carbon economy.

In December 2009, the Republic of Korea's National Assembly passed the Framework Act on Low-carbon Green Growth, which paves the way for a mandatory emissions trading scheme. While the scheme is still being developed, the Korean Presidential Committee on Green Growth has indicated that the first phase of the scheme may run from 2013 to 2015.

A number of European countries beyond the Scandinavians, including the Netherlands and Switzerland, have implemented carbon taxes.

The South African Government is also considering how to introduce a carbon price. Its National Treasury released a discussion paper in December 2010 exploring the economic rationale for, and possible approaches to, introducing a tax on carbon.

In July 2010, India imposed a clean energy tax of 50 rupees per tonne (approximately A\$1.13 per tonne) on both imported and domestically produced coal. Revenue from the tax will fund research and projects in clean energy technologies.

### **The three high-emissions developed countries**

Australia, Canada and the United States have the highest emissions per person of the developed world. The economic structure and pattern of political interests associated with exceptionally high emissions have made it difficult for these countries to break away from old patterns of energy use. The result has been that they have held back the global mitigation effort.

There has been a tendency for people in these three countries who want to avoid action to look to the other laggards for comfort. The United States is obviously more influential on this issue than the other two countries, although Australians probably underestimate the extent to which their discussions and decisions play into the American debate. Over the past year, US officials close to the president have emphasised to me the significance of Australian progress in pricing carbon to the prospects for the use of economically efficient approaches to mitigation in the United States.

Canada has now hitched its mitigation ambitions to the American wagon. Its Copenhagen commitment is to reduce 2005 emissions by 17 per cent by 2020, unless the United States' objective is varied. While the US and Canadian mitigation goals fall well below those of many other countries, and while they fall well short of the requirements of current international climate objectives, they do represent a marked departure from historical trends.

The 2008 Review demonstrated that Australia has a more acute and urgent interest in the success of climate change mitigation than the United States and Canada—indeed, than any other developed country. There is

therefore an awful incongruity in Australia taking comfort from the Canadian position in particular. Australia has a stronger interest than the others in trying to encourage all three of the high emitters to make positive contributions to the global effort.

As a close friend and ally of the United States, Australia has good reasons to look beyond narrow and specific reciprocity on climate change policy. There are many areas of common interest in which the United States carries disproportionate costs. This is true of much of the two countries' shared security interests. If it happened that in one area of shared interests, climate policy, the United States found it difficult to fully reciprocate an Australian contribution, there would be good reason for Australians to understand this as part of the fabric of a larger relationship from which it derives big benefits.

However, despite the considerable current domestic political difficulties on climate change mitigation policies, the United States is far from standing still.

A shift to a global carbon market suffered a blow when the Obama administration announced it would not pursue the passage of federal cap-and-trade legislation in 2010. But there have been considerable regional developments, with ten north-eastern and mid-Atlantic states now participating in a regional emissions trading scheme—the Regional Greenhouse Gas Initiative.

On 16 December 2010, the California Air Resources Board approved a cap-and-trade plan for California to be implemented in January 2012. Only ten national economies are larger than California's. This emissions trading scheme will be the world's second largest (after the European Union's) and aims to cut California's emissions to 1990 levels by 2020. This roughly corresponds to a reduction of 6 per cent from 2000 levels.

Of greater immediate significance, the US Environmental Protection Agency is pursuing aggressive regulatory measures, such as tightening regulatory restrictions on emissions from vehicles and mandating the closure of the most heavily polluting coal-fired power stations. Strong support for low-emissions sources of energy has been a feature of budget programs since the early stimulus packages in response to the Great Crash of 2008.

In all of these measures, the Obama administration is following the reputable scientific community. With a Nobel laureate in physics, Stephen Chu, as energy secretary, the cabinet is confidently plugged into mainstream scientific thought. It is working on the basis that climate change is a reality, that human activity is contributing influentially to it, that the human community faces large risks of disruption to its economic and political life, and that the problem is an urgent one.

The administration has remained committed to strong outcomes from international climate change negotiations. President Obama played a central role in the development of the Copenhagen Accord, and the United States was crucial in its consolidation and extension in the Cancun Agreements. The United States has left its 'minus 17 per cent' emissions reduction target on the table as a commitment under the Copenhagen Accord, necessarily qualified by references to US domestic processes. It has indicated that it will meet its commitments to the funding mechanisms established at Copenhagen and Cancun.

US officials at the highest levels state that the emissions reduction target will be met, despite the absence of a national market-based instrument for securing that result. They are supported in their statements of confidence by a number of factors. The slower economic growth that has followed the Great Crash helps a bit. The significant state-based initiatives add up to something that is noticed. The United States is enjoying a 'gas revolution', through which the competitive position of lower-emissions gas has been greatly strengthened against coal by a historically exceptional expansion in gas reserves. Finally, regulatory interventions at the federal level are becoming much more important. Let us now look at the last two of these.

The expansion of gas reserves has taken the United States by surprise. In the United States, the increase in gas reserves is associated most strongly with technological developments that have reduced the cost of large-scale gas recovery from shale deposits. A recent major study of the US gas position by the Massachusetts Institute of Technology estimates that gas reserves after depletion increased by 77 per cent from 1990 to 2010. This expansion of reserves has already reduced both average prices and their volatility, making gas a much more competitive fuel for power generation.

The opportunity for rapid expansion of the use of gas for power generation has been enhanced by the rapid expansion of gas generation capacity over recent decades. Since the removal in 1987 of various regulatory restrictions designed to preserve gas for what were thought to be socially more valuable uses, the United States added 361 gigawatts of power generation capacity, of which 70 per cent was gas-fired. Much of the new gas capacity was underutilised through a period in which gas prices were tending upwards with oil prices. It is now relatively easy and cheap to switch from coal-fired to gas-fired power generation. With greater regulatory pressure to close 'dirty coal' units, including some that are sources of high concentrations of mercury and particulates as well as greenhouse gases, there is considerable value in switching to gas-based power generation.

In recognition that there will be no market-based system of emissions reduction for the time being, the administration has increased the profile of regulation. Federal regulatory interventions are lifting the priority of emissions reduction and more generally the shift to clean energy. Stimulus spending in the aftermath of the Great Crash included programs for clean energy research, renewable energy deployment, public transportation, vehicle electrification and smart grid technology totalling US\$67 billion. These themes have been continued in subsequent administration policy. The centrepiece of new policy in President Obama's State of the Union address in 2011 was a commitment to raise the proportion of 'clean energy' in US electricity generation from 40 per cent to 80 per cent by 2035.

The path for a wider role for regulation through the Environmental Protection Agency was cleared by a Supreme Court decision in 2007 that greenhouse gases fit within the United States Clean Air Act definition of 'air pollutants'. Coupled with the agency's finding in 2009 that greenhouse gases threaten public health and the welfare of Americans, the way was paved for promulgation of greenhouse gas emissions standards for new cars and light-duty (passenger) vehicles. The new standards will apply from vehicle model year 2012, and are estimated to reduce emissions from the United States light-duty fleet by 21 per cent by 2030, relative to what they would have been in the absence of the regulations (business as usual). In May 2010, President Obama issued a memorandum to expand the scope of the regulations to cover medium- and heavy-duty vehicles, starting with the 2014 model year.

Again in recognition that in the absence of a national carbon pricing mechanism such regulatory measures will be the central instruments for reducing emissions for some time, and that they are costly, the administration is seeking to reduce costs by introducing consistent approaches to evaluating policies. A 'social cost of carbon' has been developed that is applied in assessing proposals for regulations. The resulting number, or rather numbers, as there is a range thought to be appropriate across various circumstances, are now being systematically applied in decisions on the regulation of emissions from vehicles, appliances, and power generation and industrial facilities. The 'central' price was US\$21 per tonne of carbon dioxide in early 2011. This price will be reviewed regularly.

The regulatory powers of the federal government are reducing greenhouse gas emissions and are likely to contribute much more in future. They are being challenged by the Republican majority in the House of Representatives, so far without effect.

The Obama administration included in its support for clean energy the provision of loans for new nuclear power plants. No new nuclear power plant has commenced construction in the United States since 1977. Despite fiscal and political encouragement under the Obama administration, progress remains slow. There is strong opposition from communities that have not lived with neighbouring nuclear plants, but there is often more support for the expansion of established plants. Anxieties have increased as a result of the developments in the Japanese nuclear industry following the March 2011 earthquake and tsunami. The economics of nuclear power generation have been set back by the new abundance and low cost of gas.

In an environment of regulatory focus on non-greenhouse gas pollutants from coal, local political activism against coal-based power generation, uncertainty about future pricing of emissions and low gas prices, investment in new coal-based power generation has become unlikely. Independent organisations have assessed that established regulatory measures and other policies could, in favourable circumstances, reduce US emissions by up to 14 per cent below 2005 levels by 2020. These studies do not take account of the gas revolution. The wide range of developments described above make it possible that the United States will achieve its 2020 emissions reductions targets despite the absence of economy-wide pricing of emissions. Of course, much will depend on the evolution of the national political balance in the years ahead.

### **Australia's fair share**

The Australian Government and Opposition accepted the 2008 Review's proposal that Australia should reduce emissions by 5 per cent in 2020 from 2000 levels whatever the rest of the world was doing as our contribution to keeping hopes for a strong international agreement alive. The Review recommended—and the government accepted—that Australia should also make pledges of stronger commitments calibrated to what other countries were doing. Australia should offer to reduce 2020 emissions by 25 per cent in the context of a strong international agreement focused on holding concentrations at 450 ppm corresponding to a temperature increase of about 2°C.

If the world had reached effective agreement on emissions reductions that would lead to concentrations of 550 ppm, our fair share would have been 10 per cent.

The conditional targets are crucial.

The worry is that, on current trajectories, Australia would overshoot its Cancun 2020 target (even the minus 5 per cent target) by much more than other countries. That would be damaging to the global mitigation effort.

How soon should we move our unconditional target of minus 5 per cent, and how far, in the light of others' pledges and actions?

Given our starting point, the realistic ambition is to catch up with our fair share, rather than to be a leader.

The range for conditional targets recommended in the 2008 Review and accepted by the Australian Government still seems appropriate.

The time to adjust targets would be following the government's receipt in 2014 of the first report of the proposed independent committee (see Chapter 5). It would be appropriate for the target to be the percentage reduction of emissions which, within a contraction and convergence framework leading to equal entitlements per person in 2050, represents the average percentage reductions of the developed countries. The average would be weighted by population. The percentage would be based on pledges but adjusted for evidence of underperformance or overperformance against targets. The calculations would presume (as is currently the case) that the pledges of major developing countries add up to an equivalent reduction of emissions within a modified contraction and convergence framework. If they do not, there can be an appropriate adjustment of the target.

## Conclusion

Perhaps the most extraordinary feature of the Australian public discussion of carbon pricing in 2011 is the common assertion that if Australia were to do anything to reduce emissions it would be acting alone. The assertion is often accompanied by statements that it would be economically damaging for Australia to act ahead of the world.

When you next hear someone say that he is worried that Australia might get ahead of the rest of the world in reducing greenhouse gases, take him by the hand and reassure him that he has no reason for fear.

There is no risk of Australia becoming a leader in reducing greenhouse gas emissions—others are already too far ahead. But we do run the risk of continuing to be a drag on the global mitigation effort. That is not a clever position for Australia—the developed country that is most vulnerable to climate change, and which is going through a once-in-history boom in incomes.

It would be a reasonable aim to be making good progress in catching up with the average of the developed countries. And we do have a chance of getting ahead of the pack in the way we go about reducing emissions. With carbon pricing we can do as much as others at lower cost. That is one way of getting ahead of the world that shouldn't frighten anyone.

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**PART II**  
AUSTRALIA'S PATH

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